

## **Historic, archived document**

Do not assume content reflects current scientific knowledge, policies, or practices.

REVISED

# U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1246 *rev.*

*July 1932*

## THE PEACH BORER

### HOW TO PREVENT OR LESSEN ITS RAVAGES



Rev. ed.  
follows



**T**HE PEACH BORER, the larva of a beautiful clear-winged moth, has for more than a century and a half been one of the principal obstacles to successful culture of the peach. It feeds on the soft inner bark at the base of the tree, or on the adjacent roots, seriously injuring and frequently killing the tree. Since the Bureau of Entomology discovered in 1915 that the insect can almost certainly be destroyed by applying a volatile poison known as paradichlorobenzene around the bases of infested trees, peach growers have not feared the peach borer so much, although, unless control measures are used, it still causes very serious damage.

This bulletin treats briefly of the insect's life history and habits and the use of the paradichlorobenzene treatment on trees 4 years of age and older as well as on younger trees in localities where injury from the treatment does not appear to result. Mention is also made of destroying the borers by "worming," a method suitable for use on young trees or where only a few trees are to be treated.

Orchardists using paradichlorobenzene against the peach borer are advised to employ only the pure chemical, purchasing it in a form having about the fineness of granulated sugar, or in small, thin, flaky crystals.

Washington, D. C.

Issued October, 1921  
Revised July, 1932

# THE PEACH BORER<sup>1</sup>—HOW TO PREVENT OR LESSEN ITS RAVAGES; THE PARADICHLOROBENZENE TREATMENT

By A. L. QUAINANCE, *Associate Chief, Bureau of Entomology*<sup>2</sup>  
Revised by B. A. PORTER, *Entomologist*, and OLIVER I. SNAPP, *Entomologist*,  
*Division of Fruit and Shade Tree Insects*

---

## CONTENTS

	Page		Page
Character of injury.....	1	How to control the pest.....	5
How the insect develops and lives.....	2	The paradichlorobenzene treatment.....	5
The egg.....	2	Worming.....	11
The larva, or borer.....	3		
The pupa.....	4		
The moth.....	4		

---

**A**MONG INSECT pests that attack the peach few, if any, are potentially more important or more serious than the peach borer. Throughout much of its range of distribution, east of the Rocky Mountains from Canada to Florida, it causes serious injury and the premature death of many trees wherever treatment is neglected. Fortunately, the paradichlorobenzene treatment outlined in this bulletin enables growers to deal very effectively with this insect.

The peach borer is a native of the United States and has been reported in horticultural and other literature almost from the time the early settlers introduced the peach into this country. Its original food plants were doubtless the wild cherry and wild plum, and on these it can still be found. It also attacks other stone fruits, such as nectarine, apricot, prune, almond, plum, and a few other closely related fruit trees. It is, however, preeminently injurious to the peach.

## CHARACTER OF INJURY

The injury is done by the larva, or borer, which feeds in the trunk, principally at or somewhat below the ground level, and eats galleries or burrows in the soft bark or cambium at the crown of the trees or along the larger roots. (Fig. 1.) Young trees may soon be completely girdled (see title-page) or nearly so, and older trees so injured that their vitality and crop-bearing capacity are greatly reduced. Injured trees are particularly susceptible to attack by bark beetles, may be more subject to infection by certain diseases such as root rot, and are less able to withstand periods of drought.

---

<sup>1</sup> *Aegeria exitiosa* Say; order Lepidoptera, family Sesiidae.

<sup>2</sup> Resigned Dec. 31, 1930.

Infestation by the borer is usually shown by an exudation of jelly-like gum around the crown, more or less mixed with dirt and brown pellets—the excrement, or frass, voided by the borers. (Fig. 2.) This exudation of gum is especially evident during damp or rainy weather.



FIGURE 1.—Peach borers in their galleries at the crown of a peach tree

the bases of the trees. Naturally many larvae fail to establish themselves on the trunks of the trees, but this loss is more than offset by the fact that the moths are very prolific. Observations have shown that a single female may lay more than 1,200 eggs and the average is probably between 400 and 600.

#### HOW THE INSECT DEVELOPS AND LIVES

The peach borer, in the course of its life, goes through four distinct stages—the egg; the larva, or borer; the pupa; and the adult, or parent moth. There is only one generation a year. The eggs hatch in the fall, and the young borers at once attack the trees, passing the winter as partly grown larvae in their burrows. In the spring they resume their growth and mature and spin their cocoons at various times during summer. The moths emerge during the summer and fall, the exact time differing in different localities. Shortly after emerging the moths lay their eggs.

#### THE EGG

The eggs of the peach borer are small and inconspicuous, reddish brown, oblong, and measure about one-fiftieth inch in length. (Fig. 3.) Most of the eggs are deposited on the trunk of the tree near the base, although some are placed on the limbs and foliage of the peach tree, and a few are laid on weeds and trash or on the ground at or near

## THE LARVA, OR BORER

The egg hatches in about 10 days, and the little larva coming out of it makes its way as rapidly as possible to the collar of the tree, if not already in that area, and at once begins burrowing into the bark, often entering through a crack or wound. Some of the larvae enter the trunk, or even the limbs, but these usually do not survive long. After the larva has gained entrance to the soft bark of the tree it feeds greedily and grows rapidly, and in a few weeks is sufficiently large to do material damage.

The number of larvae which may infest a single tree is often surprising, and it is a matter of wonder that trees heavily infested are not completely killed within a season. The average number of larvae to a tree in orchards differs widely according to region. In some regions there are only 2 or 3, whereas in others 8 or 10 borers are usually present. In extreme cases 40, 60, and even 90 borers have been found infesting the roots and crown of individual peach trees 6 or 7 years old.

The hatching period extends over most of the summer and fall—from late June until October, or even later in the extreme South, although most of the hatching is concentrated in a period of a few weeks in mid-summer in northern localities and in late summer or fall at southern points. Larvae of different sizes, however, ranging from quite small to nearly full grown may be found in the trees at any time during the summer and fall.

Most of the feeding occurs in the fall and spring, but in the South the borers also feed more or less during warm periods in the winter. The mature peach-borer larva (fig. 4) is about an inch long, yellowish white, with a dark reddish head. On its body are a few brownish hairs arising from tubercles.



FIGURE 2.—Gum and frass exuding from base of a peach tree, the usual sign of infestation

## THE PUPA

The peach borer, when full grown and ready to change its form, incloses itself in a cocoon of silk in which are incorporated particles of bark and excrement, forming a tough, brownish, capsulelike structure. The cocoon (fig. 5) is usually constructed at the entrance to the larval burrow or even a short distance outside it, and because it is similar in color to the bark of the tree it is often overlooked by

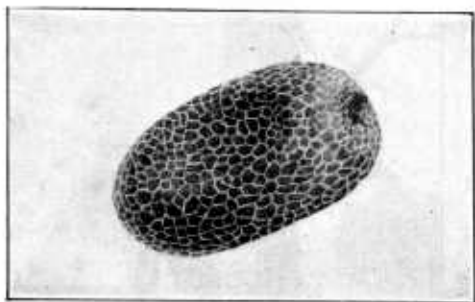


FIGURE 3.—Egg of the peach-borer moth. Enlarged sixty times

orchardists. Borers infesting the roots some inches from the base of the tree may work directly upward to the surface of the soil and there construct their cocoons. Sheltered within the cocoon the larva changes to a pupa, or chrysalis. The pupa (fig. 6) is about three-fourths of an inch in length and brown. On its back are stiff spines that assist it in working itself out of the cocoon and thus facilitate the escape

of the moth. Within three or four weeks the pupa is fully developed and wriggles out of the cocoon, the emerging moth leaving the empty skin protruding more than halfway from the cocoon. (Fig. 5.) In late summer large numbers of these empty pupal shells may often be found around the base of a heavily infested tree.

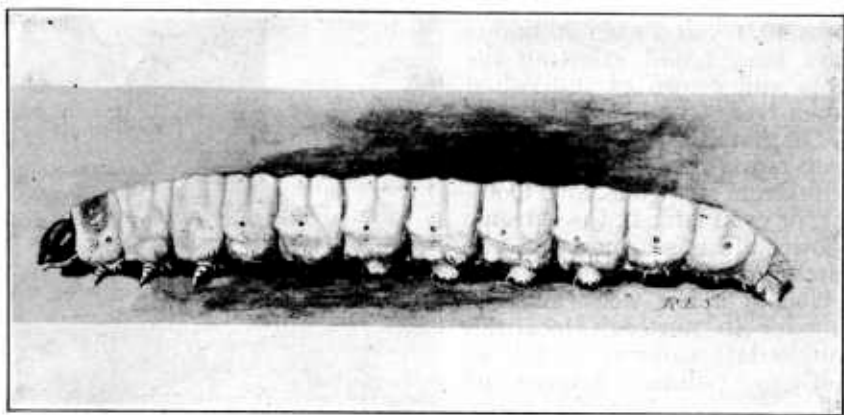


FIGURE 4.—The peach borer. Four times natural size

## THE MOTH

The moths of the peach borer are beautiful clear-winged insects, the male differing strikingly from the female in markings. The wings of the male (fig. 7) are transparent, with steel-blue trimmings along the margin and veins, and its abdomen is marked with narrow yellow bands, quite conspicuous on the steel-blue ground color. The female (fig. 8) is steel blue, with opaque forewings, and has one or two orange-colored bands around the abdomen.

The adults are day fliers and, because of their general resemblance to wasps when on the wing, are sometimes mistaken for wasps. Mating takes place and oviposition begins very soon after emergence. It is doubtful whether the moths feed to any extent, and within a few days the eggs have been deposited, and the moths have died.

#### HOW TO CONTROL THE PEST

##### THE PARADICHLOROBENZENE TREATMENT

In 1915 E. B. Blakeslee, of the Bureau of Entomology, began experiments in the use of various toxic gases as possible means of controlling the peach borer, and in the course of this work developed the paradichlorobenzene treatment. This treatment was promptly adopted by peach growers in many sections, and an extensive fund of experience with this material, based on large-scale commercial use, and on further experiments by the Bureau of Entomology and by nu-



FIGURE 5.—The peach-borer cocoon and empty pupal skin. Three times natural size



FIGURE 6.—Pupa of the peach borer. Enlarged four times

merous State agricultural experiment stations, has now been accumulated.

##### PARADICHLOROBENZENE DESCRIBED

Paradichlorobenzene, often referred to as "para" "PDB," or simply "gas," is a white crystalline substance having an etherlike odor and vaporizing readily under favorable conditions. The vapor, while harmless to persons and domestic animals under ordinary conditions, is poisonous to insects confined in its fumes for a sufficient length of time. It is heavier than air and readily permeates the soil. The chemical is, for practical purposes, noninflammable, and the fact that it is a finely divided solid adds much to the ease with which it may be applied. In purchasing paradichlorobenzene, or-



chardists should demand a grade having the fineness of granulated sugar or in small, thin, flaky crystals. Only the pure chemical should be purchased. Then, if there is some loss by evaporation in the containers the portion of the chemical that remains is always 100 per cent pure. If the chemical is mixed with some inert material, the loss by evaporation will be loss of the chemical only, and the strength of the remaining mixture will be unknown.

#### WHEN TO APPLY IT

Application of paradichlorobenzene to peach trees for the control of the peach borer is most effective in the fall, after most of the

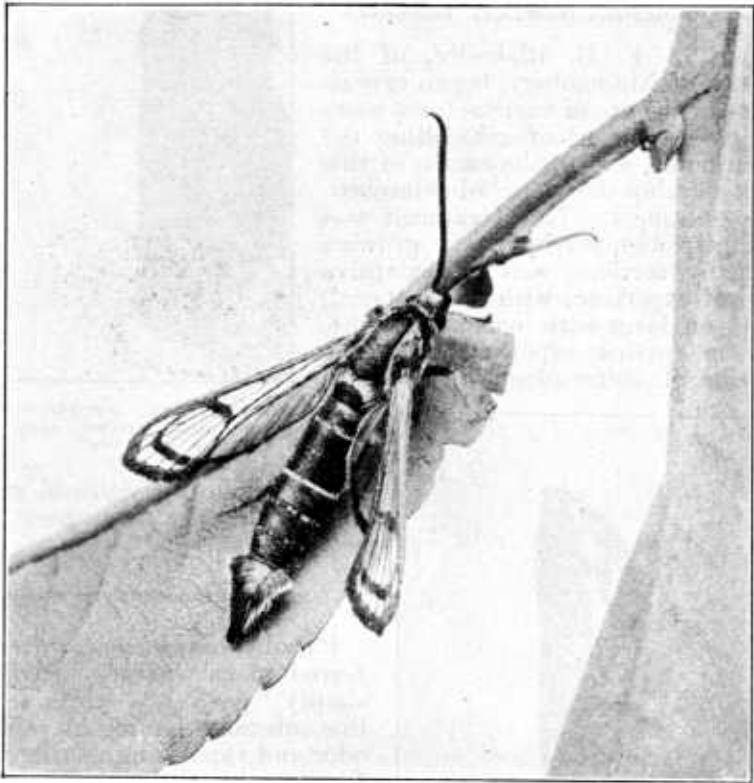


FIGURE 7.—Adult male of the peach borer resting on leaf. Enlarged four times

moths have oviposited. At this time many of the larvae are still small and more or less exposed, and hence are more susceptible to the gas than if they were deep in their burrows in the crown and roots. Applications must not be delayed, however, until the soil temperature is so low that the chemical will not volatilize properly. Many studies have been made on the soil temperatures best for the application of the chemical, and the following approximate dates have been tentatively decided upon as best, on the average, for different regions:

Michigan, New York, and New England States.....	Sept. 1-10
Southern Lake region, New Jersey, Pennsylvania.....	Sept. 15-25
Ozark region, Ohio Valley, Maryland, Virginia, Delaware.....	Sept. 20-30
Northern Georgia, the Carolinas, Tennessee.....	Sept. 25-Oct. 5
Central Georgia.....	Oct. 10-15
Southern Georgia.....	Oct. 15-20

If the paradichlorobenzene is applied within the dates indicated any late-hatching larvae will likely be killed by the gas which will continue to come from the chemical for a period of several weeks.

Fall applications are most effective, but if these have been neglected or were poorly timed, treatment sometimes becomes desirable in the spring. Spring applications of the chemical have given a fairly satisfactory kill, although the borers have by that time, of course, caused a great deal more damage than would have occurred

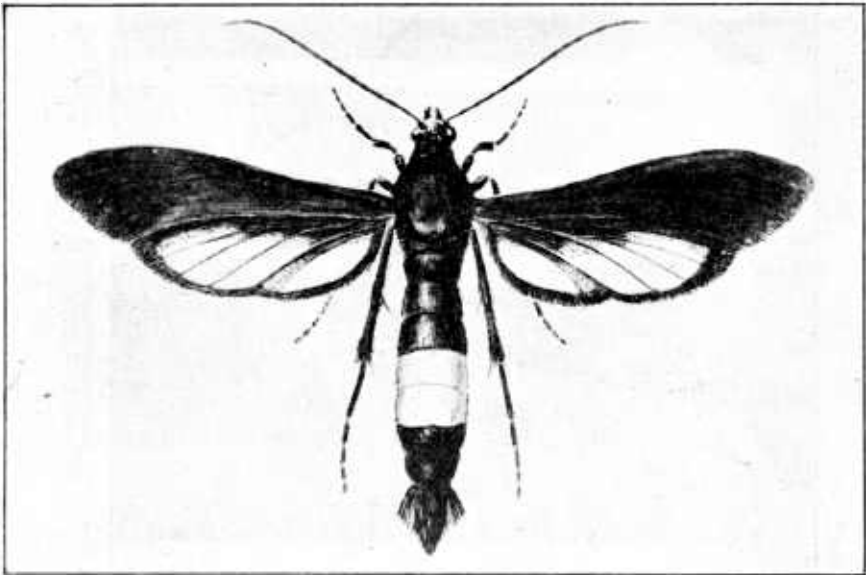


FIGURE 8.—Adult female of the peach borer. Four times natural size

if they had been killed in early fall while still small. Spring treatment should be given as soon as the ground begins to warm up, the exact time differing with the locality.

#### PREPARING THE TREES

The earth for 15 or 18 inches around the base of trees should be cleaned of grass and weeds and leveled off, without, however, digging up the soil any more than necessary to break the surface crust. (Fig. 9, A.) If borers are in the trunk somewhat above the ground level, as indicated by the presence of gum or frass, a few shovelfuls of earth should be thrown around the tree and leveled off to form a bed on which the chemical will rest above the infested part of the trunk, for this heavy gas sinks rather than rises through the

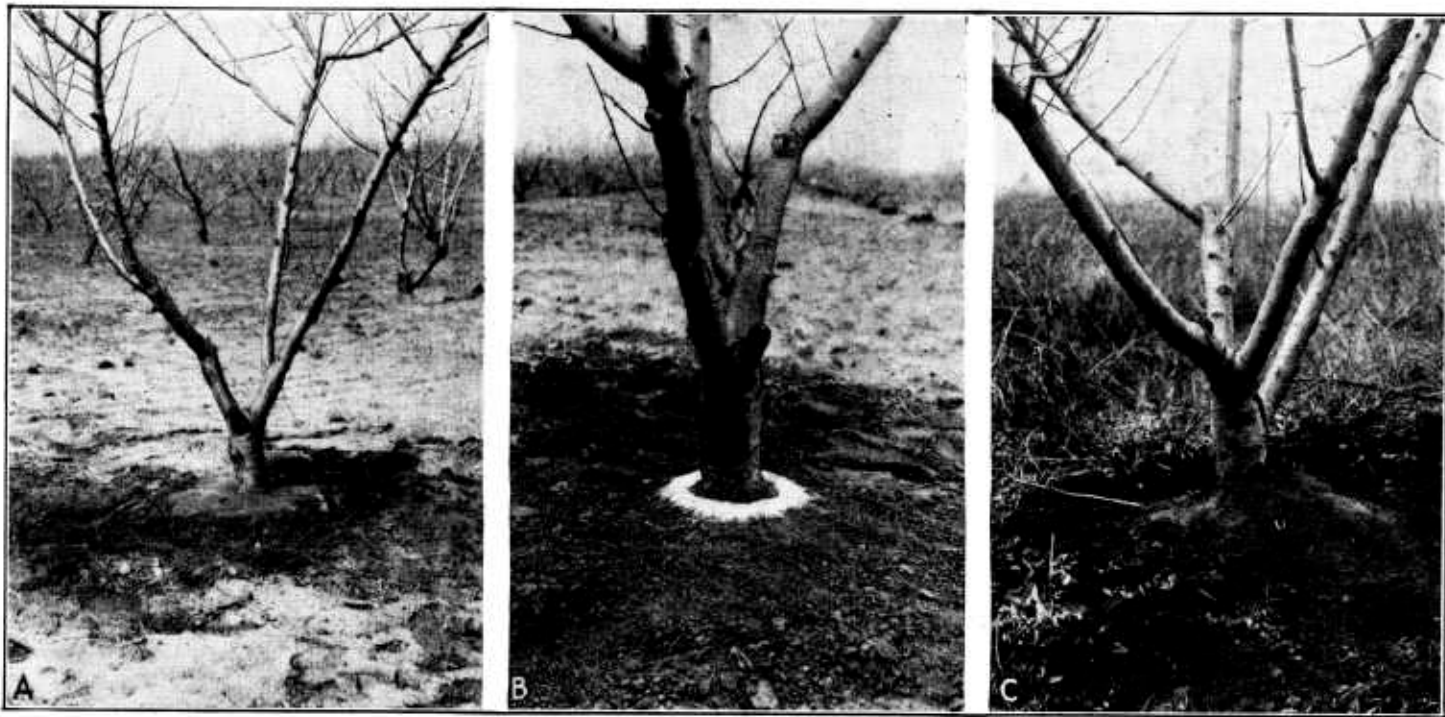


FIGURE 9.—Steps in the correct method of treating trees with paradichlorobenzene: A, The soil around this peach tree has been made ready for treatment; B, the ring of crystals should be from 1 to 1½ inches from the tree trunk; C, several shovelfuls of soil should be placed on top of the ring of crystals and packed lightly with the back of a shovel

soil. (Fig. 10, A.) As a rule, raising the soil level around the tree is unnecessary and is undesirable because the mound may be washed down by rain and the effectiveness of the treatment reduced. If there is a decided mound of earth around the collar of the tree, it should be scraped down level with the surrounding soil. Excessive gum and frass should be removed. Exposed roots should be covered with a light layer of soil, since they are less resistant to gas fumes than is the bark of the trees.

#### APPLYING THE CHEMICAL

After the soil has been prepared, the chemical is applied evenly in a band an inch or so wide entirely around the tree, care being taken that the inner part of the band is an inch to an inch and a half from the trunk. (Fig. 9, B.) The crystals should not be placed in contact with the tree (fig. 10, B), since they may injure it, nor should they be placed too far from the tree (fig. 10, C), in which case not enough gas will reach the tree trunk to be effective. For mature trees of average size 1 ounce, by weight, should be used; for unusually large trees an ounce and a half is sometimes needed; for trees 4 to 5 years old three-fourths of an ounce; and for trees 1 to 3 years of age one-half ounce, or slightly less, should be used. If many trees are to be treated, a container holding exactly the required amount of paradichlorobenzene is a great convenience. A small metal cup holding an ounce is often furnished with the chemical by insecticide dealers. As soon as the paradichlorobenzene has been applied, it should be covered with several shovelfuls of dirt, and the dirt packed with the back of the shovel (fig. 9, C) to make a cone-shaped mound.

Labor arrangements should be made to apply the chemical at the right time for its proper evaporation. In large commercial operations the work can well be divided among sections, with enough men in each section, under a competent foreman, to carry it along expeditiously. One group can prepare the trees for the paradichlorobenzene, another group can apply the chemical, and the third group can follow immediately to cover the crystals and mound the trees.

In late spring or early summer it is well to level off the mounds remaining from the previous season's treatment. This permits the new generation of borers to enter the tree at the normal location on the trunk, and facilitates the subsequent application of paradichlorobenzene.

Under normal temperatures the chemical applied at the recommended dates usually evaporates in four to six weeks. If unusually low temperatures prevail, or if frequent rains keep the soil wet, the evaporation of the chemical may be considerably retarded. Under such conditions, especially on younger trees, it is sometimes desirable to tear down the mounds after from four to six weeks in order to prevent the injury which might result from a prolonged exposure to the fumes of the chemical.

If the mounds are torn down in late fall, just before winter sets in, fresh earth should be placed around the tree to prevent winter injury in event of a sudden drop in temperature.

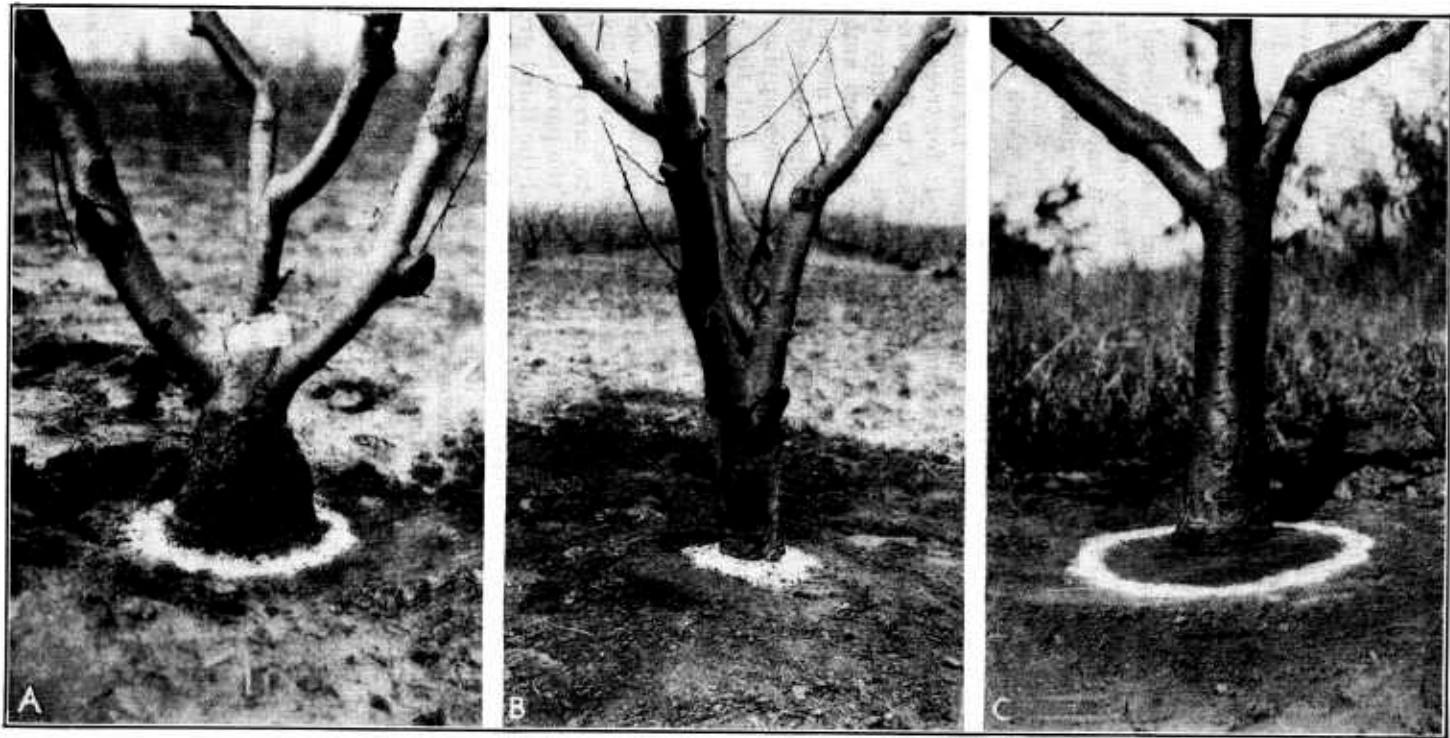


FIGURE 10.—Wrong ways of applying paradichlorobenzene: A, The paradichlorobenzene should be placed at a point above the topmost borer gallery; a mound should have been placed around this tree to a point above where the borers are working, so that the crystals could be placed above them as shown in Figure 9. B; B, if the chemical is placed against the tree trunk, severe injury may result; C, here the crystal ring is too far from the tree trunk to give effective results

## INJURY

Under certain conditions paradichlorobenzene may cause injury to peach trees. This injury first becomes evident as brown flecks in the bark layers, which may continue into the cambium. In cases of severe injury these flecks converge into spots, forming a continuous layer of sour, brown tissue, which finally dies. If the injury extends all the way around the trunk, it will be fatal to the tree.

In the work of the Bureau of Entomology, the paradichlorobenzene treatment has caused no injury to trees 6 years of age or older. In a few instances slight injury has occurred to trees 4 and 5 years of age, but it has rarely proved serious. On trees 1, 2, and 3 years old, the use of paradichlorobenzene has resulted in injury in some localities, particularly in Georgia and New Jersey. In a few cases the injury has been severe enough to kill the trees. In experiments in the Middle West, on the other hand, only slight traces of injury have been detected in orchard trees of any age, and in no case has this injury been so severe as the injury caused by borers in untreated trees. The commercial peach growers of the Middle West have treated hundreds of thousands of young orchard trees without injury of any consequence. In deciding whether to treat young trees, growers should therefore be guided by the experience of other growers in their own sections. The paradichlorobenzene treatment has been found quite injurious to peach trees in the nursery and is therefore not recommended for such trees.

## WORMING

Before the development of the chemical method of combating the peach borer, growers relied for control chiefly upon digging the borers out by hand. This method is still very useful for the control of the borer in young trees in regions in which paradichlorobenzene is likely to cause injury and also for small plantings or single backyard trees, where it is inconvenient to obtain a supply of the chemical.

Worming peach trees is a disagreeable and arduous task, and is likely to be slighted by the average worker. Unless done conscientiously and thoroughly, with proper care to remove all borers and to avoid unnecessary injury to the trees, worming is only partially effective and of questionable expediency.

In preparation for worming, the earth should be removed from around the crown of the tree to a depth of 4 or 5 inches, and if feasible the trunk should be brushed or scraped to remove loose bark and dirt. With a little experience the worker can readily locate the borers in their burrows and remove them with a knife or other suitable tool. In worming, care should be taken not to cut the sound bark more than necessary, and the cutting should be done vertically. Carelessness in the use of worming tools may result in as much damage to trees as that caused by the insects. After trees have been wormed it is desirable, if practicable, to go over them again a few days later, when the location of any larvae missed during

the first examination will usually be indicated by the exuded excrement or frass. When the worming has been completed the earth should be replaced around the trees, especially before freezing weather sets in.

If worming is to be done, it is helpful to mound the trees somewhat during the early summer. This causes the newly hatched borers to attack the tree a little higher than would otherwise be the case, and the task of removing them by hand is somewhat simplified.

**ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE  
WHEN THIS PUBLICATION WAS LAST PRINTED**

---

<i>Secretary of Agriculture</i> -----	ARTHUR M. HYDE.
<i>Assistant Secretary</i> -----	R. W. DUNLAP.
<i>Director of Scientific Work</i> -----	A. F. WOODS.
<i>Director of Regulatory Work</i> -----	WALTER G. CAMPBELL.
<i>Director of Extension Work</i> -----	C. W. WARBURTON.
<i>Director of Personnel and Business Administration.</i>	W. W. STOCKBERGER.
<i>Director of Information</i> -----	M. S. EISENHOWER.
<i>Solicitor</i> -----	E. L. MARSHALL.
<i>Weather Bureau</i> -----	CHARLES F. MARVIN, <i>Chief.</i>
<i>Bureau of Animal Industry</i> -----	JOHN R. MOHLER, <i>Chief.</i>
<i>Bureau of Dairy Industry</i> -----	O. E. REED, <i>Chief.</i>
<i>Bureau of Plant Industry</i> -----	WILLIAM A. TAYLOR, <i>Chief.</i>
<i>Forest Service</i> -----	R. Y. STUART, <i>Chief.</i>
<i>Bureau of Chemistry and Soils</i> -----	H. G. KNIGHT, <i>Chief.</i>
<i>Bureau of Entomology</i> -----	C. L. MARLATT, <i>Chief.</i>
<i>Bureau of Biological Survey</i> -----	PAUL G. REDINGTON, <i>Chief.</i>
<i>Bureau of Public Roads</i> -----	THOMAS H. MACDONALD, <i>Chief.</i>
<i>Bureau of Agricultural Engineering</i> -----	S. H. MCCROBY, <i>Chief.</i>
<i>Bureau of Agricultural Economics</i> -----	NILS A. OLSEN, <i>Chief.</i>
<i>Bureau of Home Economics</i> -----	LOUISE STANLEY, <i>Chief.</i>
<i>Bureau of Plant Quarantine</i> -----	LEE A. STRONG, <i>Chief.</i>
<i>Grain Futures Administration</i> -----	J. W. T. DUVEL, <i>Chief.</i>
<i>Food and Drug Administration</i> -----	WALTER G. CAMPBELL, <i>Director of</i> <i>Regulatory Work, in Charge.</i>
<i>Office of Experiment Stations</i> -----	JAMES T. JARDINE, <i>Chief.</i>
<i>Office of Cooperative Extension Work</i> -----	C. B. SMITH, <i>Chief.</i>
<i>Library</i> -----	CLARIBEL R. BARNETT, <i>Librarian.</i>